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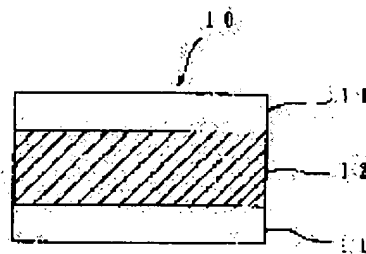
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## (54) BIODEGRADABLE CARD

## (57)Abstract:

PURPOSE: To provide a biodegradable card used as a credit card, an IC card, an identification card, an employee card, a membership card or a clinic card, constituted of a multilayered biodegradable plastic sheet, having a high-grade feeling, becoming a beautiful card and biodegradable in a reclaiming site or compost after use.

CONSTITUTION: A biodegradable card 10 is characterized by that a multilayered biodegradable plastic card is obtained by laminating over sheets 11 composed of a thermoplastic polymer based on polylactic acid or a lactic acid/ oxycarboxylic acid copolymer to both surfaces of a biodegradable plastic sheet being a center core 12.



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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] About the biodegradability card used for a credit card, a money card, an ID card, an IC card, an identification card, a personnel certificate, a membership card, a medical-examination certificate, etc., especially this card consists of multilayer biodegradability sheets plastic, and this invention has a high-class feeling, serves as a beautiful card, and, moreover, relates to soil in reclamation processing or compost after card used at the biodegradability card in which biodegradation is possible.

[0002]

[Description of the Prior Art] Conventionally, various cards are used in broad fields, such as an ID card proving a status, a money card which has a member card and money-value, and a credit card. If a user uses the card and usually finishes using after being sold or lent to a user, abandonment processing of these cards will be carried out. For example, as for most of the credit card which is circulating now, a money card, an ID card, etc., the product made from a vinyl chloride with a thickness of 700-800 micrometers is used abundantly. The card by these vinyl chloride material prints a proper pattern to both sides of about 500-micrometer white pin center, large core, sticks about 100-micrometer transparent chlorination vinyl sheet on both sides of this pin center, large core by the heat press method, and forms a card base material in them. While printing a pattern, alphabetic information, etc. to these card base materials furthermore, adjustable information was recorded on the magnetic-recording section or the optical Records Department which prepared on the card base material.

[0003] By sticking a transparent sheet on the pattern and alphabetic information printed to the pin center, large core, an alteration and forgery became difficult and this card was also one of the security measures. Moreover, the plastics card by the vinyl chloride of these former etc. is disposed of by reclamation etc. as incineration or waste, when it now becomes used.

[0004] On the other hand, the card which adopted paper as a card base material conventionally is used, and disposal processing of incineration, reclamation, etc. is easy for especially paper, and moreover, since the manufacturing cost is cheap, let it be the optimal card material for solution of environmental problems, such as dust about which it argues in recent years. However, if fitness as a card, such as endurance, bending-proof nature, water resistance, chemical resistance, waterproofness, surface smooth nature, and glossiness, is taken into consideration when paper is used as a card base material, since a function is inferior at all points, the use by independent [ of paper ] would be limited only to temporary use of a passing ticket, an admission ticket, a ticket, etc., etc., and will have been made unsuitable for the card used during a fixed period. In this case, although it is possible that they carry out a laminating to a paper base, using outer layers other than synthetic resin, such as polyethylene, polypropylene, a polyvinyl chloride, and a polyethylene terephthalate, and plastics, such as an aluminum foil, as a protective layer, these have a problem in abandonment nature and have a fault without a conventional plastics card and conventional great difference.

[0005] Furthermore, as it is in JP,57-150393,A, JP,59-220192,A, JP,51-93991,A, and JP,63-260912,A,

the plastics which can be decomposed under natural environment, such as light or underground, is developed, and especially, it comes to be used for thrown-away type goods, and is commercialized at present part. In the field of this card, using the plastics of resolvability for a card base material is proposed by JP,5-42786,A or JP,5-85088,A.

[0006]

[Problem(s) to be Solved by the Invention] As mentioned above, the conventional card consists of a vinyl chloride, ABS plastics, etc., and has the outstanding physical properties, and since it is cheap, moreover, it is used widely. However, although these cards are now disposed of by reclamation etc. as incineration or waste as abandonment processing after use In incineration processing, high temperature-ization of the combustion temperature by incineration takes place, and there are pollution problems, such as a problem of the endurance of an incinerator and combustion gas, and it sets to reclamation processing. Since it exists with the original form, without decomposing, it remains in the earth as dust semipermanently, and the influence on natural environment poses a problem.

[0007] Moreover, the exaggerated sheet which covers the pin center,large core in a card is one of the forgery / alteration preventive measures of the pattern or the proper pattern which transparency was required and was printed to the pin center,large core. Moreover, if the transparency of an exaggerated sheet falls, a printing pattern will become not clear, the pattern printed to the pin center,large core when highly transparent is seen finely, and the security effect of the printing pattern improves. However, the light transmittance of the about 100-micrometer transparent chlorination vinyl sheet marketed now is a maximum of 88%, its transparency is not enough, and, moreover, there is no resolvability.

[0008] Furthermore, most biodegradability cards proposed in recent years consist of biodegradable plastics of a simple substance, or both sides of a paper base are coated with them. These cards still had few examples which the physical properties of material original were restricted, and were applied since the stiffness of a card, intensity, resistance, etc. were inadequate. Moreover, the card which coated both sides of a paper base with the biodegradability resin could not be said to be enough in respect of endurance, bending-proof nature, water resistance, chemical resistance, waterproofness, a mechanical characteristic, etc. although resistance has improved from the punched card, but the use range was also restricted by the limit of a paper base.

[0009] Although the biodegradable plastic material of this simple substance has many things similar to polyethylene and there is softness, it is inferior in respect of a mechanical strength which is suitable for gate properties, such as stiffness in the case of machine reading and writing. Moreover, the polymer sheet which makes a principal component the copolymer of a polylactic acid or a lactic acid, and a hydroxy acid is mentioned to the mechanical strength which a card needs as a \*\*\*\*\*

biodegradability resin. However, these biodegradable plastics are still expensive and are alone considered that the problem of cost is large by manufacturing a card. Furthermore, the decomposition of catabolic rate is extremely slow in an early adding-water decomposition process, and since it is necessary to promote decomposition on heating conditions like a compost device, in a polylactic-acid system simple substance card with a thickness of 700-800 micrometers, as for the aforementioned polylactic-acid system polymer resin, catabolic rate is considered to become still later.

[0010]

[Means for Solving the Problem] This invention persons are characterized by carrying out the laminating of the exaggerated sheet which consists of thermoplastic polymer which makes a principal component the copolymer of a polylactic acid or a lactic acid, and a hydroxy acid about the above-mentioned technical problem at these both sides by using as a pin center,large core the sheet plastic with which the biodegradable plastic card which consists of multilayers according to invention according to claim 1 the result of wholeheartedly research has biodegradability at least.

[0011] According to invention according to claim 2, it is characterized by blending the filler and the additive with the resin of each class in a biodegradability card.

[0012] According to invention according to claim 3, it is characterized by performing biaxial extension processing at the resin of each class in a biodegradability card.

[0013] Moreover, the exaggerated sheet which covers pin center,large core both sides concerning the

biodegradability card of this invention is a transparent sheet, and a light transmittance is high, and since the resolvability sheet plastic which comes to carry out biaxial extension processing of the thermoplastic polymer which makes a principal component the copolymer of the polylactic acid or a lactic acid, and a hydroxy acid excellent in physical properties was used, the pattern printed to the pin center, large core is finely seen from the transparent sheet by the conventional chlorination vinyl sheet.

[0014] The pin center, large core materials of the biodegradability card of this invention can use biodegradable plastic material cheaper than the charge of an exaggerated web material, and can reduce card cost. Moreover, the plastics in which the material of a pin center, large core has biodegradability, such as chemosynthesis method aliphatic polyester, a naturally-occurring-polymers system, and a microorganism production polyester system by the fermenting method, is used, and especially limitation is not carried out.

[0015] Moreover, there is an effect in reforming of a resin, and a cost cut by being able to add various fillers to the resin of each class in the biodegradability card of this invention, and adding the filler of a proper quantity to the resin of a pin center, large core especially.

[0016]

[Function] The biodegradability card of this invention has the high light transmittance of the transparent exaggerated sheet which covers both sides, and, as for the pattern printed to the pin center, large core, appears still more finely than the transparent web material of the conventional vinyl chloride by using the resolvability sheet plastic which comes to carry out biaxial extension of the thermoplastic polymer which makes a principal component the copolymer of the polylactic acid or a lactic acid, and a hydroxy acid excellent in physical properties. As mentioned above, since it is the card material which consisted of composites, the intensity to a machine also improves, and especially, it has the property and physical properties over a machine equivalent to a card conventionally, and becomes the card which does not have a bad influence in environment after abandonment processing.

[0017]

[Example] Hereafter, based on drawing, the example of this invention is explained in detail. Drawing 1 is the cross section of the biodegradability card of this invention. As shown in drawing, they are the exaggerated sheet (11) of the thermoplastic polymer which makes a principal component the copolymer of a polylactic acid or a lactic acid, and a hydroxy acid, and the biodegradability card (10) which consisted of pin center, large cores (12) of the plastics which has biodegradability.

[0018] The resin which has the biodegradability which consists of aliphatic polyester which is the polymeric materials which make a lactic acid etc. a principal component is used for the material of this exaggerated sheet (11 11), and these have resolvability, as described above, and they are already used as a charge of an absorber in the living body focusing on the medical-application material field. As a lactic acid, there are a D-lactic acid, an L-lactic acid, etc., a hydroxy acid has a glycolic acid, a 6-hydroxy caproic acid, etc., and the thermoplastic resolvability resin which makes a principal component the copolymer of the hydroxy acid represented with this invention by D-lactic acid, L-lactic acids or those mixture, D-lactic acid, L-lactic acids or those mixture, a glycolic acid, or the 6-hydroxy caproic acid is used for it.

[0019] Moreover, unlike the material of a transparent exaggerated sheet (11), the material of a pin center, large core (12) will not be limited especially if it is having biodegradability and fixed physical properties fulfilled, but the resin which has biodegradability, such as chemosynthesis method aliphatic polyester, a naturally-occurring-polymers system, and a microorganism production polyester system by the fermenting method, can be used for it. For example, you may be the mixture and layered product of plastics which can use poly glycolide, such as aliphatic polyester, such as microorganism production polyester, such as 3-hydroxybutyric acid, and [ the aliphatic polyester resin by which chemosynthesis was mainly carried out at the condensation polymerization reaction, and ] the 3-hydroxy valeric-acid copolymer P (3HB-3hyperventilation), and the poly caprolactone (PCL), and a polylactic acid, polyvinyl ARURU, starch complex, etc., and have such resolvability from a glycol and a fatty-acid dicarboxylic acid. When left by these biodegradable plastics under natural environment, it is desirable for it to be decomposed by the microorganism which exists in the inside of soil or underwater, and to decompose

into water, carbon gas, methane, etc. finally. In addition, if it is the resin which has biodegradability, it will not restrict to the above-mentioned material.

[0020] Furthermore, only by the resin mentioned above, since mechanical strength and physical properties required as a card are not fully acquired, the strong reinforcement and strong reforming to a resin are made by adding and kneading various fillers and an additive to these resins. Moreover, there is an effect also in reduction of cost by increase in quantity of a filler. Calcium-carbonate calcium, light carbonic acid calcium, colloid carbonic acid calcium, a natural silica, a kaolin, clay, titanium oxide, a barium sulfate, a zinc oxide, an aluminum hydroxide, an alumina, a magnesium hydroxide, etc. can add and knead the filler added to these resins for example, in a non-fixed form filler. Moreover, talc, a mica, glass flakes, etc. can add and knead in a tabular filler. Moreover, a wollastonite, a potassium titanate, basic magnesium sulfate, a sepiolite, a xonotlite, boric-acid aluminum, etc. can add and knead in a needlelike filler. Moreover, although a spherical filler can also be added, it pulls and there is no improvement effect like a fibrous filler and a tabular filler in bending and an impact strength.

[0021] The aforementioned filler can improve properties, such as endurance including stiffness, heat-resistant deformans, fabricating-operation nature, shock-resistant intensity, dimensional stability, and bending-proof nature, 1 - 50wt% to a resin by adding and kneading 5 - 30wt% preferably, and giving biaxial extension processing further. Although the above-mentioned filler can be added alone, it can also add simultaneously by several sorts. It is possible to have a property equivalent to the conventional vinyl chloride and ABS-plastics material by addition of this filler. In addition, it is possible to add 0.05 - 3 weight section and an antioxidant, various kinds of additives, for example, coloring inhibitor, and to add 0.05 - 3 weight section and lubricant for 0.05 - 3 weight section, an organic pigment, an inorganic pigment, etc. if needed, if it is the range which does not lose the property of the resin kneaded in addition to the filler, and it is also possible to add the matter of non-resolvability, such as polymer. However, since resolvability falls remarkably and the problem on processing arises, it is not desirable to add the matter of non-resolvability 30% or more.

[0022] The method of kneading the above-mentioned resin has dryblend, a melting blend, etc., and the forming method of the kneaded resin has T die extrusion molding, calendering-roll fabrication, etc., and the sheet-like base material used for a pin center, large core sheet (12) and an exaggerated sheet (11 11) is fabricated by the method chosen suitably. Furthermore, properties, such as the stiffness of a base material, a moldability, shock resistance, dimensional stability, thermal stability, and bending-proof nature, can be further raised by giving and carrying out heat stabilization of the biaxial extension processing under heating of a sheet-like base material, as described above.

[0023] Moreover, the method of carrying out the laminating of the exaggerated sheet (11 11) to a pin center, large core sheet (12) has a dry lamination, wet lamination, and heating pressurization melting lamination etc. In addition, after printing a pattern etc. on a pin center, large core sheet, by carrying out a lamination, the pattern of printing can view clearly and also produces security nature. Moreover, in this invention, a filler can also be added only on a pin center, large core sheet besides the above-mentioned laminating composition, and it is also possible to carry out the laminating of the exaggerated sheet only to one side.

[0024] Like the case of the conventional paper and plastics card, the card base material produced by the above-mentioned method can perform printing and processing, and can print the pattern of further others, and information on a base material. Methods, such as offset printing, screen printing, and gravure, can be used for the printing method. Finally, a card is pierced by the size of 86x54mm with a cutting die, and a biodegradability card is obtained.

[0025] A concrete example is explained below to <the example 1>. After carrying out extrusion molding to the thickness of a 200 degrees C [ of working temperatures ] convention of a resin (the Shimadzu make, tradename "Lacty") with a T die melting extruder, biaxial extension processing was performed, calender processing was performed further, and the transparent sheet for exaggerated sheets with a thickness of 100 micrometers was produced. Moreover, after kneading white \*\*\*\* (product [ made from Shiroishi Industry ], tradename R06), and titanium oxide 5wt% with a dual-drum-arrangement extrusion kneading machine as a filler resin (Showa High Polymer Co., Ltd. make, tradename Bionolle) 65wt%,

the sheet with a thickness of 500 micrometers was fabricated at 180 degrees C of working temperatures with the T die melting extruder, calender processing was performed further, and the pin center, large core sheet was produced. The pattern was printed on this pin center, large core sheet, and the composite for lamination and biodegradability cards with a thickness of 700 micrometers was further produced for the previous exaggerated sheet to both sides of a pin center, large core sheet. Finally, it pierced to size 86mmx54mm with the cutting die for cards, and the biodegradability card was obtained.

[0026] The exaggerated sheet of these card both sides has good transparency, and since there is a light transmittance no less than 94%, the pattern printed by the pin center, large core sheet can be checked finely. Moreover, when this card was laid underground into the upland soil and the decomposition state was observed periodically, a card having begun to collapse three months after and having collapsed in the half mostly after six-month progress was checked.

[0027] When the vinyl chloride card with a <example 1 of comparison> thickness of 760 micrometers was laid underground into soil and the state was observed periodically, although it became yellow partially, it checked that the configuration was held and was not decomposed after six-month progress.

[0028]

[Effect of the Invention] In the biodegradability card of this invention, when the whole card had biodegradability and an exaggerated sheet adopted the plasticity resin which makes a principal component the copolymer of a polylactic acid or a lactic acid, and a hydroxy acid excellent in transparency, the pattern printed to the pin center, large core could be viewed finely, and the biodegradability card with a high-class feeling was obtained. Moreover, it is produced by the compound method, properties over fabricating-operation nature and a machine, such as intensity and physical properties, are excellent, moreover, biodegradation of abandonment processing is attained in soil or compost, and a biodegradability card turns into a card which does not have a bad influence on environment. Moreover, since this invention is the card which consisted of composites, intensity's to a machine improves, has a mechanical characteristic equivalent to especially the card made from a vinyl chloride, and physical properties, and serves as a card which does not have a bad influence on environment after abandonment processing. Furthermore, since a lot of fillers can be added on a pin center, large core sheet and loss in quantity of an expensive biodegradability resin material is made to it, various effects, such as a cost cut of a biodegradability card, are done so.

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[Translation done.]